

REMARKS

Claims 1 – 28 have been examined. Claims 1, 3, 4, 7, 11 – 15, 17, 18, 26, and 27 stand rejected under 35 U.S.C. §102(e) as anticipated by U.S. Pat. No. 6,846,745 (“the '745 patent”); and Claims 1 – 28 stand rejected under 35 U.S.C. §103(a) as unpatentable over the '745 patent in view of U.S. Pat. No. 6,794,290 (“the '290 patent”).

The independent claims have been amended to recite specific flow rates: amended Claim 1 provides flow rates for the “halogen precursor” and for the “hydrogen precursor”; amended Claim 20 provides flow rates for the “fluorine-containing gas” and for H₂; and amended Claim 26 provides flow rates for the “first precursor gas” and for the “second precursor gas.” Support for these flow rates is provided in the application at, e.g., p. 26, ll. 1 – 8. The combination of limitations now recited is not taught or suggested by the cited art.

For example, in the rejection of independent Claim 1 as anticipated by the '745 patent, the Office Action notes its teaching to include a flow of silane during the etching process (Office Action, pp. 7 – 8). It is apparent that the disclosure of using silane during the etching process is as a source of silicon ('745 patent, Col. 9, ll. 10 – 12: “Other process gases may be provided with the fluorine-containing compound(s). These include, for example, oxygen, inert carrier gases, and silicon-containing gases”); the inclusion of hydrogen in the silane flow is incidental to the described etching mechanisms. The disclosed flow rate for silane in the '745 patent is 0 – 60 sccm (*id.*, Col. 9, l. 14), with the '745 patent specifically noting a preference for the lower end of this range.

This is in contrast to the amended claim, which requires a relatively high flow of the hydrogen precursor. The recitation of such a high flow reflects the recognition by the inventors that hydrogen may react chemically with the halogen precursor as part of a scavenging mechanism that permits improved control over chemical etching by the halogen precursor (Application, p. 9, ll. 29 – 31). This in turn provides improved control over the isotropic component of etching during the etching process and over the relative contributions to etching from isotropic and nonisotropic sources (*id.*, p. 9, l. 31 – p. 10, l. 4).

This is relevant to the obviousness rejection of Claim 1 over the '745 patent in view of the '290 patent because neither of those patents recognize that such a mechanism may be

used. To the extent it discloses the use of a hydrogen precursor during the etching, the '745 patent teaches that only low flow rates be used. While Applicants acknowledge that the '290 patent teaches the use of relatively high flow rates of H₂ (*see, e.g.*, '290 patent, Col. 7, Table 2), such a teaching is made in the context of a process that does not use halogen flows at all during the etching process — indeed, the '290 patent repeatedly distinguishes between the use of halogens and hydrogen to provide a chemical etch, noting circumstances where use of a hydrogen etch instead of a halogen etch is advantageous (*see, e.g., id.*, Col. 7, ll. 40 – 46).

The prior art thus fails to teach or suggest the combination of a halogen precursor with a high-flow hydrogen precursor. Such a combination is not taught or suggested in either reference independently. And there is no motivation to combine the teachings of the two references in this way because the '745 patent teaches that hydrogen flows should be low and the '290 patent teaches that hydrogen flows should be used instead of halogen flows. In suggesting that the teachings of the references be combined, the Office Action relies on the disclosure of using a flow of silane in the '745 patent to infer that an effective etch may still be obtained when halogen and hydrogen precursors are combined. Such an inference is necessarily limited to circumstances when the hydrogen flow is low — to combine the references in the context of the amended claims would ignore the teachings away from the combination that both references provide.


Independent Claim 1 is accordingly believed to be patentable, as are independent Claims 20 and 26 for similar reasons. The various dependent claims are believed to be patentable by virtue of their dependence from patentable claims.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 303-571-4000.

Respectfully submitted,


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